

NDF05N50ZH

Product Preview

N-Channel Power MOSFET 500 V, 1.5 Ω

Features

- Low ON Resistance
- Low Gate Charge
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Rating	Symbol	Typ	Unit
Drain-to-Source Voltage	V _{DSS}	500	V
Continuous Drain Current R _{θJC}	I _D	5 (Note 1)	A
Continuous Drain Current R _{θJC} , T _A = 100°C	I _D	3.2 (Note 1)	A
Pulsed Drain Current, V _{GS} @ 10 V	I _{DM}	20 (Note 1)	A
Power Dissipation R _{θJC}	P _D	28	W
Gate-to-Source Voltage	V _{GS}	±30	V
Single Pulse Avalanche Energy, I _D = 5.0 A	E _{AS}	130	mJ
ESD (HBM) (JESD22-A114)	V _{esd}	3000	V
RMS Isolation Voltage (t = 0.3 sec., R.H. ≤ 30%, T _A = 25°C) (Figure 14)	V _{ISO}	4500	V
Peak Diode Recovery	dv/dt	4.5 (Note 2)	V/ns
Continuous Source Current (Body Diode)	I _S	5	A
Maximum Temperature for Soldering Leads	T _L	260	°C
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Limited by maximum junction temperature
2. I_S = 4.4 A, di/dt ≤ 100 A/μs, V_{DD} ≤ BV_{DSS}, T_J = +150°C

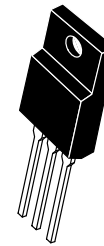
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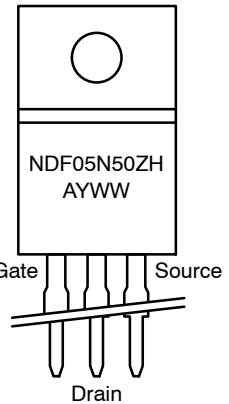
<http://onsemi.com>

V _{DSS}	R _{DS(ON)} (MAX) @ 2.2 A
500 V	1.5 Ω

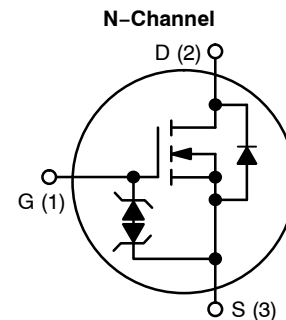


TO-220FP
CASE 221AH

MARKING DIAGRAM



A = Location Code
Y = Year
WW = Work Week
H = Halogen Free Package



ORDERING INFORMATION

Device	Package	Shipping
NDF05N50ZH	TO-220FP	50 Units / Rail (In Development)

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THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.4	°C/W
Junction-to-Ambient Steady State (Note 3)	$R_{\theta JA}$	50	

3. Insertion mounted

4. Surface mounted on FR4 board using 1" sq. pad size, (Cu area = 1.127 in sq [2 oz] including traces).

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	500			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C , $I_D = 1\text{ mA}$		0.6		V/°C
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	25°C		1	μA
			150°C		50	
Gate-to-Source Forward Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$			±10	μA

ON CHARACTERISTICS (Note 5)

Static Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 2.2\text{ A}$		1.25	1.5	Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 50\text{ μA}$	3.0		4.5	V
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 2.5\text{ A}$		3.5		S

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		530		pF
Output Capacitance	C_{oss}			68		
Reverse Transfer Capacitance	C_{rss}			15		
Total Gate Charge	Q_g	$V_{DD} = 250\text{ V}, I_D = 5\text{ A},$ $V_{GS} = 10\text{ V}$		18.5		nC
Gate-to-Source Charge	Q_{gs}			4		
Gate-to-Drain ("Miller") Charge	Q_{gd}			10		
Plateau Voltage	V_{GP}			6.5		
Gate Resistance	R_g			4.5		Ω

RESISTIVE SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 5\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 5\text{ Ω}$		11		ns
Rise Time	t_r			15		
Turn-Off Delay Time	$t_{d(off)}$			24		
Fall Time	t_f			14		

SOURCE-DRAIN DIODE CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Diode Forward Voltage	V_{SD}	$I_S = 5\text{ A}, V_{GS} = 0\text{ V}$			1.6	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0\text{ V}, V_{DD} = 30\text{ V}$ $I_S = 5\text{ A}, di/dt = 100\text{ A/μs}$		255		ns
Reverse Recovery Charge	Q_{rr}			1.25		μC

5. Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%.

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TYPICAL CHARACTERISTICS

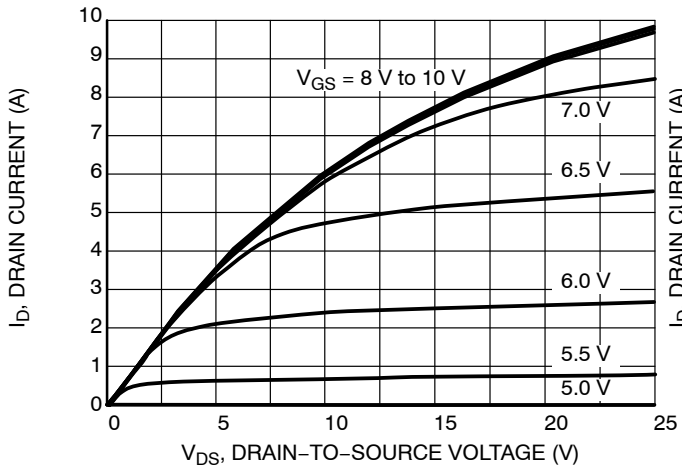


Figure 1. On-Region Characteristics

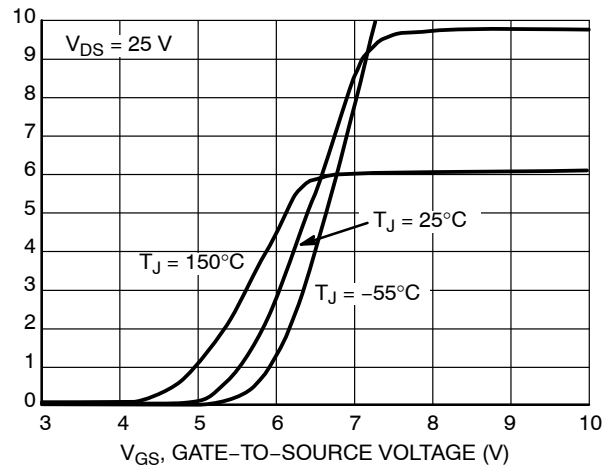


Figure 2. Transfer Characteristics

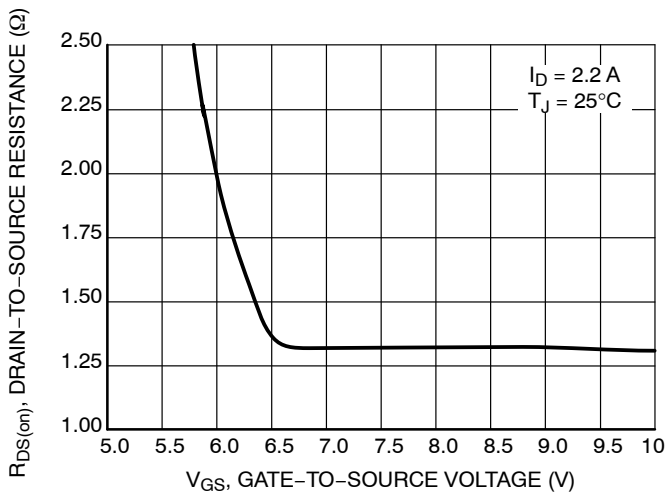


Figure 3. On-Region versus Gate-to-Source Voltage

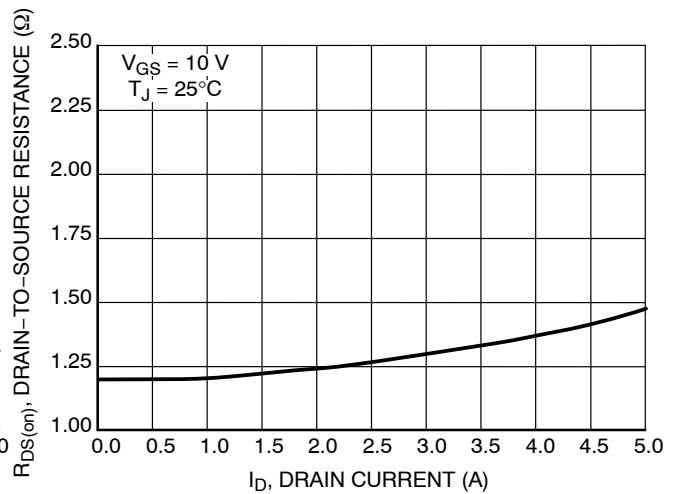


Figure 4. On-Resistance versus Drain Current and Gate Voltage

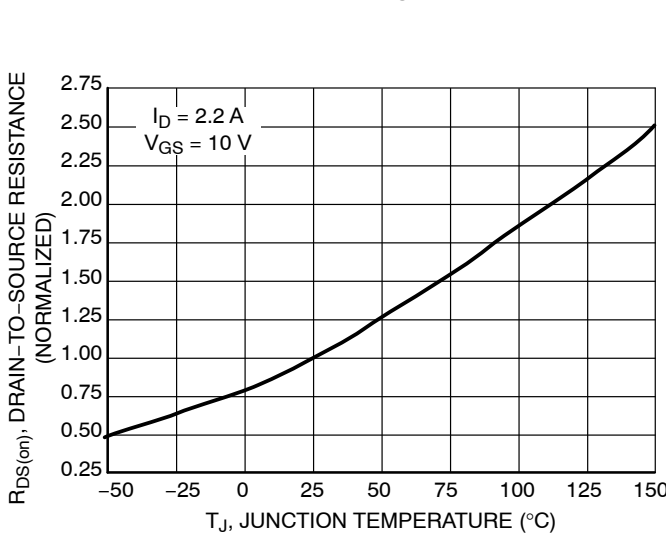


Figure 5. On-Resistance Variation with Temperature

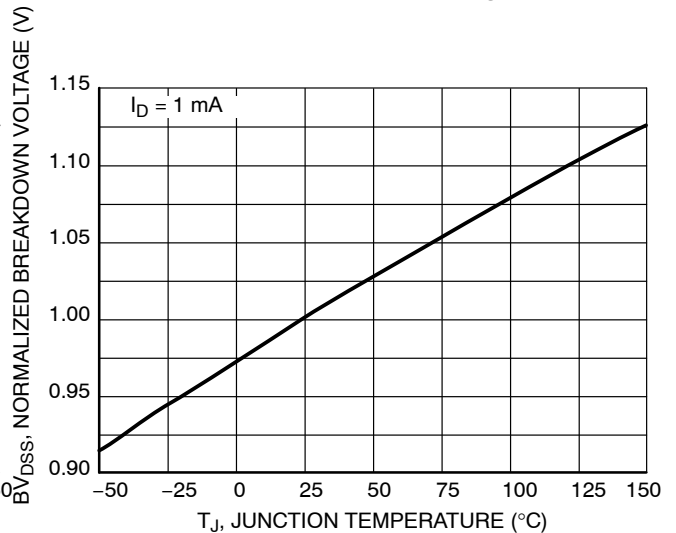


Figure 6. BV_{DSS} Variation with Temperature

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TYPICAL CHARACTERISTICS

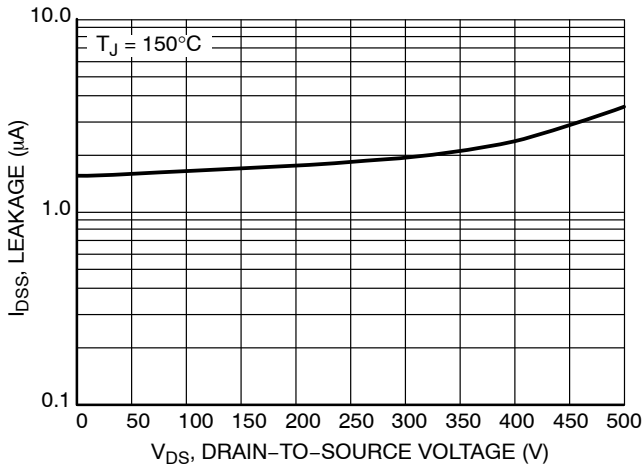


Figure 7. Drain-to-Source Leakage Current versus Voltage

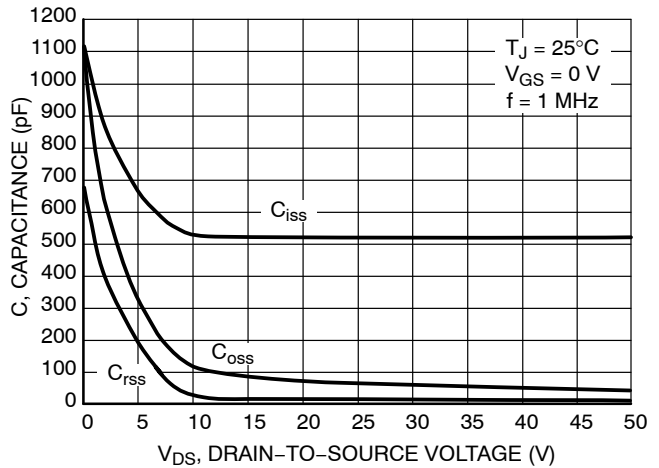


Figure 8. Capacitance Variation

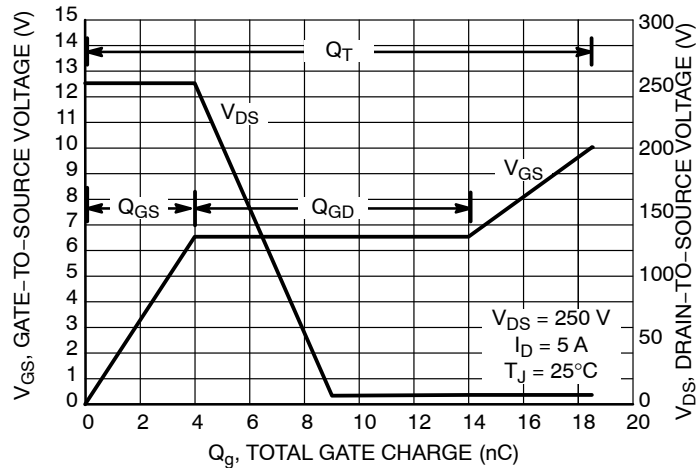


Figure 9. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

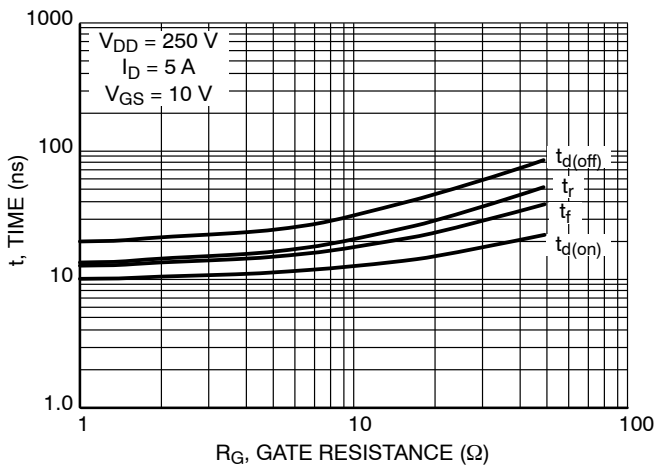


Figure 10. Resistive Switching Time Variation versus Gate Resistance

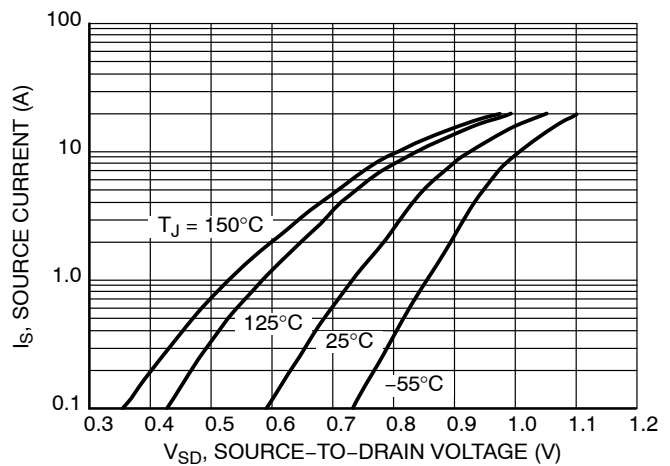


Figure 11. Diode Forward Voltage versus Current

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TYPICAL CHARACTERISTICS

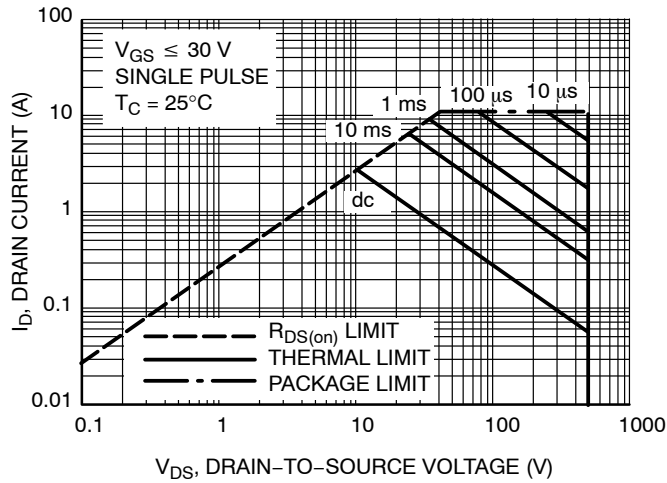


Figure 12. Maximum Rated Forward Biased Safe Operating Area

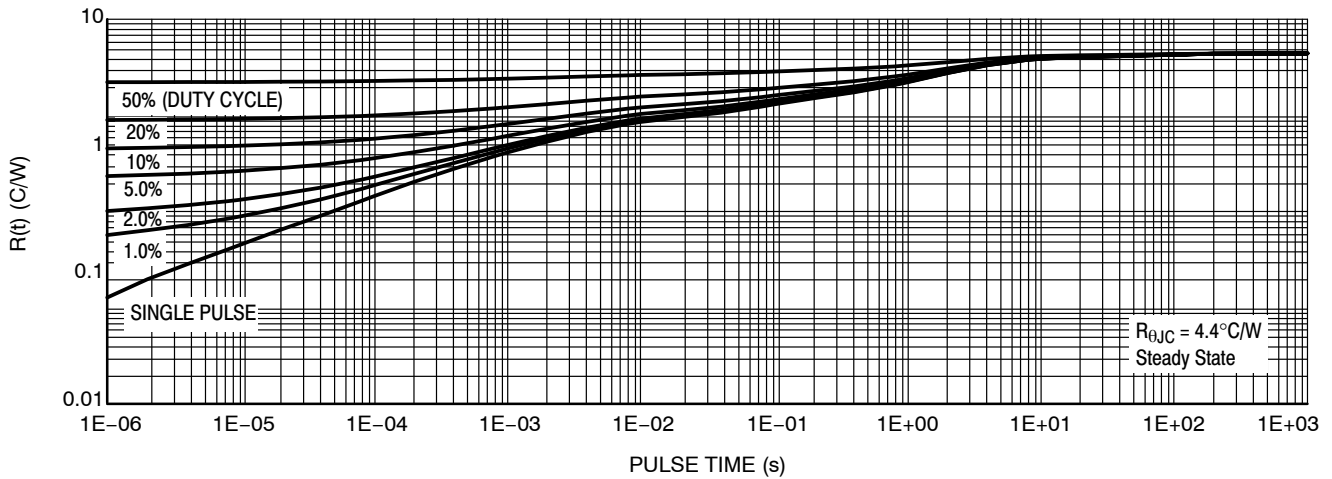


Figure 13. Thermal Impedance (Junction-to-Case)

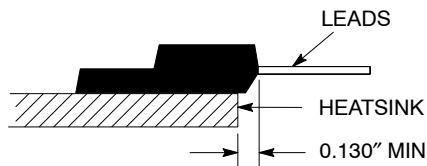


Figure 14. Isolation Test Diagram

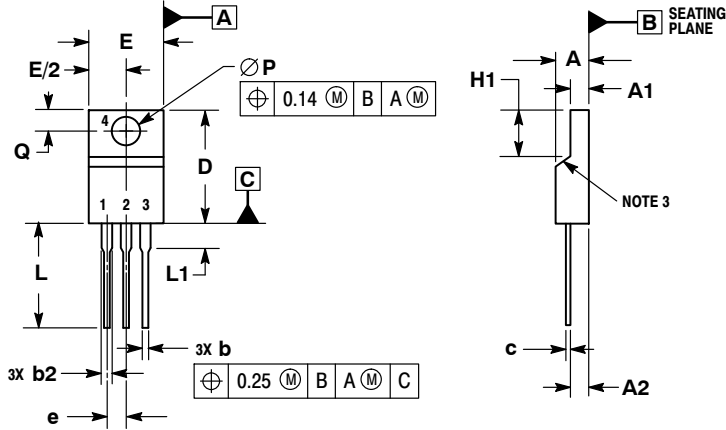
Measurement made between leads and heatsink with all leads shorted together.

*For additional mounting information, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NDF05N50ZH

PACKAGE DIMENSIONS

TO-220 FULLPACK, 3-LEAD
CASE 221AH-01
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR UNCONTROLLED IN THIS AREA.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH AND GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.00.

DIM	MILLIMETERS	
	MIN	MAX
A	4.30	4.70
A1	2.50	2.90
A2	2.50	2.70
b	0.54	0.84
b2	1.10	1.40
c	0.49	0.79
D	14.22	15.88
E	9.65	10.67
e	2.54 BSC	
H1	5.97	6.48
L	12.70	14.73
L1	---	2.80
P	3.00	3.40
Q	2.80	3.20

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